

## **REMARKS/ARGUMENTS**

### **Claim Amendment**

By the claim amendment presented, Claim 1 is rewritten to indicate that the methyl-*p*-toluate enriched, Witten process stream, which is reacted with the specified diol reactants to form the claimed composition, must also contain (in addition to methyl-*p*-toluate) dimethyl terephthalate, methyl-*p*-formyl benzoate, *p*-toluic acid and no more than 3 wt% of methyl benzoate. Support for reciting these specific aromatic reactants used to form the Claim 1 composition can be found in Table I in Paragraph [0030] of the published version (U.S. 2006/0223925) of the originally filed specification.

Upon entry of the claim amendment presented, Claims 1 - 7 and 26 - 28 remain in the application. No additional claims fee is due as a result of this claim amendment.

### **Invention Synopsis**

The present invention as it is now claimed is directed to toluate-based ester compositions useful as a plasticizers, extenders, or diluents in polymer formulations. Such compositions comprise mixtures of mono- and/or di-esters. These esters are prepared from the reaction of certain specified diols, such as diethylene glycol and triethylene glycol, with a certain type of methyl-*p*-toluate enriched reactant stream. This methyl-*p*-toluate-enriched stream must contain specific recited components including dimethyl terephthalate, methyl-*p*-formyl benzoate, *p*-toluic acid and methyl benzoate in addition to the primary reactant methyl-*p*-toluate. Such a stream can conveniently be provided as part of the Witten process for the preparation of dimethyl terephthalate and must contain no more than 3 wt% of the methyl benzoate component. The mixed ester compositions which result from the esterification/transesterification reaction between these two types of materials (selected diols and selected mixture of aromatic reactants) are liquid compositions of low volatility and have a viscosity of less than 0.35 pascal second at 25 °C.

The toluate ester based compositions of this invention can be used as is or can be combined with extenders such as tall oils or modified tall oils or natural vegetable

oils. The resulting compositions find use as low volatility extenders, diluents and solvents for polymers such as polyvinyl chloride and phenolic resins.

### **Formal Matters**

Claims 1-7 and 26-28 have been rejected under 35 U.S.C. §112, Second Paragraph, as allegedly being indefinite. The Examiner contends that these claims are indefinite because it is unclear what materials in the methyl-*p*-toluate enriched streams react with the esterifying or transesterifying diols. Such a rejection is respectfully traversed as it would apply to the claims as amended herein.

In the amended claims, the methyl-*p*-toluate enriched stream used to prepare the compositions herein is now characterized by setting forth a recitation of specific aromatic esters and acids in such a stream. The amended claims also still specifically name the diols (e.g., ethylene-based glycols) which react with these aromatic esters and acids to form the claimed compositions. The skilled artisan would be well aware that all of the recited aromatic compounds are susceptible to being mono- and/or di-esterified and/or transesterified with each of the specifically recited glycols and diols. It is further submitted that the artisan skilled in organic chemistry would know this and also would appreciate that the resulting compositions would comprise mixtures of the different types of mono- and di-esters which would result from such esterification and transesterification reactions.

Applicant has discovered that the specified product-by-process type of ester mixtures as claimed herein are low viscosity, low volatility materials which make them especially useful as extenders, solvents, plasticizers and/or diluents for polymer compositions. Advantageously, these ester mixtures do not have to be further purified, separated or broken down into their individual mono- or di-ester constituents in order to have the desired viscosity and volatility characteristics. Given that the reactants and the type of reaction carried out to form the claimed compositions are precisely specified, it is submitted that the skilled artisan would be able to easily identify and determine the metes and bounds of the product-by-process compositions being claimed. Such amended product-by-process type composition claims would therefore be in complete compliance with the definiteness requirements of 35 U.S.C. §112, Second Paragraph,

notwithstanding the fact that the individual ester components of such compositions are not each identified by name and concentration.

## **Art Rejections**

### **Rejection Over Hulsmann et al**

As in the Final Office Action issued during pre-RCE prosecution, Claims 1-5 and 26-27 have now been rejected under 35 U.S.C. §103(a) as allegedly being unpatentably obvious over Hulsmann et al (U.S. Patent No. 4,112,240, hereinafter "Hulsmann"). The Examiner contends that the Hulsmann disclosure of the product of the reaction of a methyl benzoate-enriched stream with dipropylene glycol is suggestive of the methyl-*p*-toluate stream/glycol and diol reaction products of the rejected claims. Such a rejection is respectfully traversed as it would apply to Claims 1-5 and 26-27 as amended herein.

By way of review, Hulsmann discloses the preparation of an ester mixture formed by the catalytic transesterification of a process stream rich in methyl benzoate by reacting such a stream with dipropylene glycol. The resulting transesterification product is said to have good color and be useful as a PVC plasticizer. The methyl benzoate stream which is used to provide the Hulsmann transesterified product is said to be a by-product stream of the process for making dimethyl terephthalate. This methyl benzoate stream used in the Hulsmann invention, however, is one which has been prepared and processed to contain at least 80% by weight of methyl benzoate.

It is respectfully submitted that the Hulsmann reference discloses esterification of a significantly different type of process stream than the one used to make the mixed ester product of the present invention. Even though both streams may be derived from the commercial production of DMT, it is apparent that the Hulsmann stream which is transesterified with dipropylene glycol must contain at least 80 wt% of methyl benzoate, whereas the methyl-*p*-toluate stream used to prepare applicant's compositions can contain no more than 3 wt% of methyl benzoate.

The Examiner urges that the methyl benzoate-containing mixtures used to make the Hulsmann compositions would be expected to contain at least some methyl-*p*-toluate, thereby rendering the transesterification of methyl-*p*-toluate obvious. Applicant, however, is not broadly claiming compositions which result from the simple

transesterification of methyl-*p*-toluate, no matter whether alone or in combination with any other materials. Rather, applicant's claimed compositions are made by esterification/transesterification of a narrowly defined mixture of aromatic reactants which must contain a major amount of methyl-*p*-toluate and which can only contain a very small amount of the methyl benzoate reactant which must be used in high concentrations to prepare the Hulsman materials.

It is further noted that the esterification agent used to make the Hulsman ester mixtures is also different from the esterification/transesterification agents used to make applicant's claimed compositions. Whereas the Hulsman ester mixtures are made using dipropylene glycol as the esterifying agent, the methyl-*p*-toluate-enriched mixture used to make applicant's compositions is esterified/transesterified not with Hulsman's dipropylene glycol but rather with ethylene, diethylene or triethylene glycol or butanediol.

The Examiner urges that even though the process used to prepare applicant's compositions may be different from the process used to prepare the Hulsman mixtures, applicant has not shown that the claimed compositions have different properties than the Hulsman compositions. To support this position, the Examiner cites cases stating that when claimed and prior art products are identical or substantially identical in structure or composition, then a presumption is established that the claimed products are anticipated or rendered obvious by the prior art.

But in the instant situation, neither the mixture of aromatic reactants nor the esterification/transesterification agents used to make the applicant's claimed compositions are identical or substantially identical to the counterpart elements used to make the Hulsman compositions. The instantly claimed and Hulsman-disclosed ester mixtures are completely different, and are indeed mutually exclusive, with respect to both the type of aromatic reactant mixtures and the types of esterifying/transesterifying diols used in their respective preparation. Accordingly, the nature of the ester make-up of the Hulsman compositions and the compositions of the present invention are also so completely different that one cannot properly be said to suggest the other.

Given the foregoing considerations, it is clear that the Hulsman patent does not obviously suggest the compositions of applicant's presently presented Claims 1-5 and

26-27. Therefore, continued rejection of these amended claims under 35 U.S.C. §103 over Hulsmann would be improper.

Rejection Over Arendt et al (Arendt II) or Emerson et al

Claims 1-5, 26 and 27 have been further rejected under 35 U.S.C. §103(a) as allegedly being unpatentably obvious in view of Arendt et al (U.S. Patent No. 6,184,278, hereinafter "Arendt II") or Emerson et al (U.S. Patent No. 2,585,448, hereinafter "Emerson"). The Examiner contends that the Arendt II and Emerson general disclosures of diethylene glycol and triethylene glycol esters of benzoic or toluic acid suggest ester compositions of applicant's claimed component makeup and further suggest compositions which would inherently have the low viscosity and low volatility characteristics of applicant's claimed ester compositions. Such a rejection is also respectfully traversed as it would apply to Claims 1-5 and 26-27 as amended herein.

Arendt II is a divisional of U.S. Patent No. 5,990,214 ("Arendt '214") which was applied in rejection of Claims 1-5 during pre-RCE prosecution of this application. Accordingly, Arendt II has essentially the same disclosure as the Arendt '214 reference, the rejection over which was dropped after applicant's previous traversal. Both Arendt '214 and Arendt II disclose liquid glycol benzoate compositions which comprise a particular combination of C<sub>2</sub> and C<sub>3</sub> glycol esters such that the freezing point of this ester mixture is below the freezing point of the constituent esters. Such ester mixtures are said to be useful as plasticizers for polymers. Although primarily directed to combinations of benzoic acid esters (which are the only type of compositions exemplified in the Arendt references), Arendt '214 and Arendt II do generally indicate that esters of toluic acid can also be used. Arendt '214 and Arendt II, however, do not disclose any particular source or purity level of the benzoic acid or toluic acid (or halides or anhydrides thereof) which can be used to make the Arendt ester mixtures. There is certainly no disclosure in Arendt '214 or Arendt II of the transesterification reaction of C<sub>2</sub>-C<sub>3</sub> glycols with methyl-*p*-toluate (as an alternative to unesterified toluic acid) or any mixtures of applicant's specifically recited aromatic reactants which are enriched in methyl-*p*-toluate. Furthermore, no viscosity or volatility characteristics, even in general terms, are given for any of the Arendt ester mixtures.

Like the Arendt references, Emerson discloses resin plasticizers which are specific mixtures that can include esters formed from glycols and aromatic monocarboxylic acids such as benzoic and alkyl-substituted benzoic acids. Like the Arendt references, Emerson does not disclose any transesterification of a methyl-*p*-toluate starting material or esterification/transesterification of any methyl-*p*-toluate-enriched mixtures containing the other specifically recited aromatic materials of applicant's Claims 1-5 and 25-26. Rather, the Emerson ester mixtures are prepared by reacting glycols with mixtures of aromatic and aliphatic monocarboxylic acids.

It is respectfully submitted that the Arendt and Emerson references all fail to disclose or suggest at least one essential feature of the compositions of applicant's amended Claims 1-5 and 26-27. This is the feature that the claimed ester mixture be prepared from a methyl-*p*-toluate enriched mixture, i.e., a mixture of methyl-*p*-toluate with other specifically recited aromatic esters and acids such as are found in a process stream from the Witten process for making dimethyl terephthalate. It is the glycol transesterification reaction product obtained from certain glycols and this particular combination of aromatic reactants which applicant has found to have especially useful low viscosity and low volatility properties. The Arendt and Emerson ester mixtures are simply not made in this specified way and accordingly would not be expected to have the same make-up, properties and characteristics as the toluate ester based compositions of applicant's amended Claims 1-5 and 26-27.

Given the foregoing considerations, it is clear that the Arendt and Emerson patents are not suggestive of the specific type of compositions now described in applicant's presently presented Claims 1-5 and 26-27. Therefore, continued rejection of these claims as amended herein under 35 U.S.C. §103 over Arendt '214, Arendt II or Emerson would be improper.

#### Rejection of Claims 6, 7 and 28

Claims 6, 7 and 28 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentably obvious over Hulsmann, Arendt II or Emerson in view of GB 947764 (cited as CAS Online Citation 60:69197, hereinafter "GB '764"). The Examiner contends that it would have been obvious to add "tall oil fatty acids" to "glycol benzoate plasticizer

compositions" in light of the GB '764 disclosure of soybean fatty acid derivatives in glycol benzoate plasticizers, to thereby realize applicant's claimed compositions. Such a rejection is also respectfully traversed as it would apply to Claims 6, 7 and 28 as amended herein.

GB '764 discloses a plasticized poly(vinyl chloride) composition which comprises dipropylene glycol benzoate and epoxidized soybean fatty acids along with a number of other ingredients. GB '764 does not disclose any resins plasticized with (poly)ethylene glycol or butanediol toluate esters or with any esters in combination with unepoxidized tall oil fatty acids or natural oils.

It is submitted that while GB '764 might suggest the use of some kinds of fatty acid derivatives in combination with the Hulsmann, Arendt II or Emerson ester materials, that suggestion does not result in the applicant's claimed combination of different fatty acid derivatives with applicant's mixed esters of methyl-*p*-toluate which are themselves different from the Hulsmann, Arendt II and Emerson transesterified materials. In other words, the GB '764 reference simply does not rectify the deficiencies in the teachings of Hulsmann, Arendt II or Emerson with respect to the specific components of applicant's claimed compositions. GB '764 uses neither the same kinds of glycol esters nor the same kind of fatty acids or derivatives thereof as are recited in applicant's Claims 6, 7 and 28 as amended herein. It cannot therefore be properly concluded that the skilled artisan reading all of Hulsmann, Arendt II, Emerson and GB '764 together would obviously be led to prepare the same kinds of compositions as are described in the claims rejected over these four references.

Given all of the foregoing considerations, it is respectfully submitted that the reference combination of Hulsmann, Arendt II, Emerson and GB '764 is not one which is properly said to suggest or render obvious the particular fatty acid/oil-containing toluate ester compositions of applicant's Claims 7, 6 and 28 as amended herein. Continued rejection of these amended claims under 35 U.S.C. §103(a) over Hulsmann, Arendt II or Emerson in view of GB '764 would therefore be improper.

### Conclusions

Applicant has again made an earnest effort to place her application in proper form and to distinguish her claimed invention from the applied prior art. WHEREFORE, reconsideration of this application, entry of the claim amendments presented herein, withdrawal of the claim rejections under 35 U.S.C. §§103 and 112, and allowance of Claims 1-7 and 26-28 as amended herein, are all respectfully requested.

Any comments or questions concerning this application can be directed to the undersigned at the telephone number given below.

Respectfully submitted,

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By: 

George W. Allen  
Registration No. 26,143  
Attorney for Applicant

INVISTA North America S.à r.l.  
Three Little Falls Centre/1052  
2801 Centerville Road  
Wilmington, DE 19808  
Telephone: (302) 683-3316  
Facsimile: 302-683-3473